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ELECTRICAL CONNECTOR PIN WITH WIPING ACTION
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3,458,851

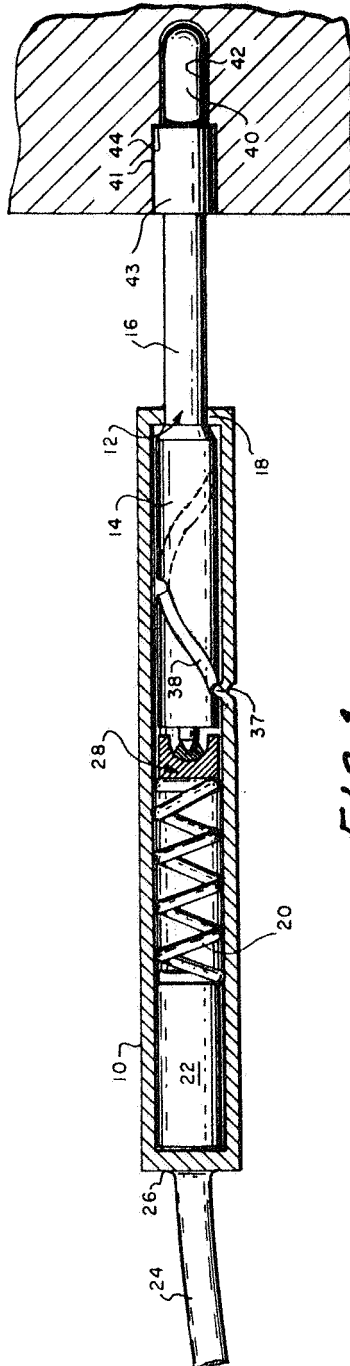


FIG. 1

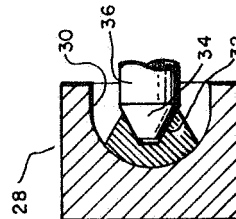


FIG. 2

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**ELECTRICAL CONNECTOR PIN
WITH WIPING ACTION**

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3 Claims

ABSTRACT OF THE DISCLOSURE

An electrical connector pin that provides a wiping action between contacting surfaces. The connector pin comprises an outer housing in which a probe or pin is slidably disposed. The housing has an internal boss that engages a helical groove in the probe so that relative movement of the housing with respect to the probe will rotate the probe. One end of the probe is adapted to be inserted into a socket so there results a wiping action between the probe and socket.

The invention described herein was made in the performance of work under a NASA contract and is subject to the provisions of Section 305 of the National Aeronautics and Space Act of 1958, Public Law 85-568 (72 Stat. 435; 42 U.S.C. 2457).

The invention described herein relates in general to electrical probes or pin connectors adapted to be plugged into electrical sockets present in various types of electrical and electronic equipment. More particularly, this invention is an improved probe or pin connector wherein provision has been made for rotation of that portion of the probe which is inserted into a mating socket.

Electrical connector pins which are adapted to be plugged into various types of electronic equipment are well known and commonly used. Such connectors normally consist of a pin or rod like members extending from a handle portion so the device can be grasped and the pin inserted into a mating socket. The connector will normally have an electrical lead connected thereto which leads away to another electrical connection of some type. The electrical connections made utilizing a socket and pin arrangement are sometimes faulty due to corrosion and/or accumulation of foreign material on the mating surfaces of the socket and pin. The occurrence of such a poor connection is not readily detectable and when a great number of such connectors are employed in setting up an electronic apparatus such as a computer testing device a faulty electrical connection can result in a considerable expenditure of time and effort in locating such poor connection.

The present invention provides an electrical connector pin which is capable of making reliable electrical connections due to a wiping action which occurs between the male connector (pin) and the female connection (socket) when a connector pin constructed in accordance with this invention is employed. The connector pin comprises, briefly, an outer housing and a probe partially disposed within said housing. That portion of the probe disposed within the housing is moveable therein and has a helical groove formed thereon. The housing has an interior surface with a boss extending inwardly therefrom which engages the helical groove in the probe. Axial movement of the housing with respect to the probe results in rotation of the probe due to the camming action of the boss riding in the helical groove. Thus, the end of the pin connector which is inserted into a mating socket will be rotated with respect to the socket to provide the wiping action which assures a reliable electrical connection.

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It is therefore an object of this invention to provide an electrical connector capable of providing a reliable electrical contact when inserted in a mating socket.

A yet further object of this invention is to provide an electrical connector that includes a housing and a probe partially disposed within said housing and means for rotating said probe with respect to said housing to assure a reliable electrical connection.

Other objects and attendant advantages of the present invention will become more apparent after considering the following detailed description in conjunction with the attached drawing wherein:

FIGURE 1 of the drawing is a cross-sectional view of the new and improved electrical connector inserted in a mating socket.

FIGURE 2 is an enlarged view of a pivot bearing and associated bearing surface. There is shown an electrical connector comprising a housing 10 and a probe 12 that includes an enlarged section 14 which is slidably disposed within housing 10. Probe 12 also includes a smaller section 16 which extends axially from housing 10. Housing 10 has an inwardly extending flange portion 18 that defines an opening which is larger in diameter than section 16 of the probe, but is smaller in diameter than section 14 of the probe. Thus, the flange portion functions to retain probe 12 in housing 10. A coil spring 20 is disposed within housing 10 and a guide cylinder 22 is disposed around one end of spring 20 and attached thereto by suitable means (not shown) such as welding or brazing. An electrical lead 24 is soldered, crimped or otherwise connected to closed end 26 of housing 10. Guide cylinder 22 is retained within the housing by closed end 26 of the housing.

A pivot bearing 28 is positioned within the housing and disposed between spring 20 and section 14 of the probe. Pivot bearing 28 has a cavity 30 formed therein which opens toward section 14 of the probe. Cavity 30 further has a conical projection formed in the bottom thereof which extends outwardly and has a bearing surface 32 formed thereon. Bearing surface 32 engages a bearing surface 34 formed on a stud 36 which extends axially from section 14 of probe 12. Bearing surfaces 32 and 34 are disposed in an angular relationship such that when the two surfaces are engaged they tend to maintain the probe in a position of alignment with respect to housing 10 and thus facilitate rotation of probe 12.

Section 14 of probe 12 has a helical groove 38 formed in the periphery thereof. A boss 40 is formed on the interior surface of housing 10 and this boss extends inwardly into the helical groove formed in the probe so as to cause rotation of the probe when housing 10 is moved axially with respect thereto.

The smaller diameter section of probe 12 is adapted to be inserted in a socket 41 of an electric or electronic test apparatus. A pilot tip 40 at one end of the probe 12 functions as a hole or socket finder and is adapted to enter a smaller diameter portion 42 of the socket 41. Probe 12 has an enlarged portion 43 formed thereon which functions to wipe the wall of the socket 42 and also wipe a shoulder surface 44 at the entrance to the smaller diameter socket portion 42.

The operation of the device described herein is believed apparent from the foregoing description. When the probe is inserted or engaged in the socket 41 with the portion 43 bearing on the shoulder surface 44 and pressure is applied to housing 10, probe 12 and thus enlarged portion 43 is forced to rotate due to the camming action of boss 40 in helical groove 38. Rotation of enlarged portion 43 within socket 42 produces a wiping action that results in an improved electrical contact.

While a preferred exemplary embodiment of the invention has been described herein it will be readily apparent to those skilled in the art that there are many changes and modifications which can be made to the invention without departing from the spirit and scope of the invention as defined in the claims appended hereto. For example, it may be desirable in some applications to omit the pivot bearing or in other applications it may be desirable to insulate housing 10. Also, it may be expedient to provide the connector with a stabilizing or retainer means to prevent withdrawal of the connector from the socket. The connector may also be used for electrical connections with a conducting element having a single diameter socket therein such as the socket portion 42 to receive only the pilot tip 40 with the shoulder of portion 13 wiping an electrical contact around the socket entrance.

What is claimed is:

1. An electrical pin connector adapted to be inserted in a mating socket comprising:

- a tubular housing having an inwardly extending flange portion at one end thereof and the other end closed;
- a rod shaped probe member comprising a first section and a second section, said first section being larger in diameter than said second section;
- said first section of said probe member being shorter in length than said tubular housing and slidably disposed therein; said first section of said probe member being retained in said tubular housing by said flange portion which defines an opening larger in diameter than said second section of said probe member and smaller than the diameter of said first section of said probe member;
- said second section of said probe member extending from said tubular housing for insertion in a mating socket;
- resilient means mounted in said tubular housing between the closed end thereof and said probe for biasing the first section of said probe to one end of said tubular housing;
- a helical groove formed in the periphery of said first section of said probe member;
- an inwardly projecting boss formed on the interior

surface of said tubular housing that extends into said helical groove, whereby axial movement of said probe member relative to said tubular housing will rotate said probe to provide a wiping action and thus improved electrical contact between said probe member and a mating socket; and

a pivot bearing disposed within said tubular housing between said resilient means and said first section of said probe member to facilitate rotation of said probe member.

2. The pin connector recited in claim 1 wherein said pivot bearing includes:

- (a) a short cylindrical body having a cavity formed in one end thereof which opens toward the first section of said probe member;
- (b) said cylindrical body further including a frustoconical projection formed in the bottom of said recess that includes a first bearing surface formed thereon;
- (c) said first bearing surface engaging a second bearing surface formed on a stud that projects axially from said first section of said probe toward said short cylindrical body; and
- (d) said first and second bearing surfaces being disposed in an angular relationship such that the first section of said probe is supported to prevent binding thereof in said tubular housing when said probe member is rotated relative thereto.

3. The pin connector recited in claim 2 wherein said probe member further includes an enlarged portion formed on said second section of said probe member for wiping the walls of the mating socket.

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AWARDS ABSTRACT

Electrical Connector Pin with Wiping Action

The present invention is an electrical connector pin of a type inserted in a receiving hole or socket such as is commonly found in electrical test equipment. The invention includes structure which provides a wiping action as the connector pin is inserted in the socket. Connectors of this type are primarily adapted for use in various types of electrical test apparatus where many and various types of electrical connections are required.

The electrical connector pin comprises an outer housing 10 in which a spring 20 and a probe 12 is disposed. Probe 12 consists of an enlarged cylindrical section 14 which is slidably mounted with respect to said housing 10 and reciprocates therein when pressure is applied to the housing. Spring 20 functions to bias the probe to one end of the housing. A pivot bearing 38 is disposed within the housing and positioned between spring 20 and probe 12 to facilitate rotation of the probe with respect to the housing. The interior surface of housing 10 has a boss 37 formed thereon which extends into a helical groove 38 formed in probe 12. It is readily apparent that when a force is applied to housing 10 so as to move the housing with respect to probe 12, the camming action of boss 37 in helical groove 38 will result in rotation of probe 12. One end of probe 12 has an enlarged portion 43 formed thereon which is adapted to be inserted into an electrical socket 42. Rotation of enlarged

portion 43 with respect to socket 42 will result in the wiping action which assures a reliable electrical contact therebetween.

The novelty of this invention appears to lie in the means provided for causing rotation of probe 12 to cause the wiping action of enlarged portion 43 on socket 42 and thus assure a reliable electrical connection.

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